IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Inventor:	Tetsuya ISHII	Group Art Unit: 2872
Appln. No.:	09/672,455	Examiner: A. Chang
Filed:	September 29, 2000	
For:	DIFFRACTIVE OPTICAL ELEMENT	

RESPONSE UNDER 37 CFR § 1.116

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Final Rejection dated September 11, 2003, Applicant petitions for a three-month extension of time and submits the following remarks.

REMARKS

Reconsideration and allowance are respectfully requested in light of the following remarks.

Claim 52 stands objected to, under 35 USC §132, for reciting new matter and stands rejected under 35 USC §112, first paragraph, for failing to comply with the written description requirement. Claim 52 also stands rejected, under 35 USC §102(b), as being anticipated by Knop (US 4,426,130). Claims 36, 40, and 42 stand rejected, under 35 USC §103(a), as being unpatentable over Sakata (US 4,729,640). Claims 36, 40, 42, and

52 stand rejected for nonstatutory double patenting. Applicant respectfully traverses the objection and rejections.

A terminal disclaimer is enclosed herewith to overcome the double patenting rejection.

The Final Rejection proposes that claim 52 recites new matter and fails to meet the written description requirement because it recites refractive indices for the claimed optical regions satisfying the relationship of $n_1<n_2<n_3$. Support for this claimed feature is provided in Fig. 13 and its related description in the specification, from page 39, line 25, to page 41, line 10. In an exemplary but non-limiting embodiment described on page 40, lines 2-9, a first optical region 104 is made of a fluorine-containing resin having a refractive index of 1.34149, a second optical region 105 is made of a UV curable resin having a refractive index of 1.52, and a third optical region 106 is made of a polycarbonate having a refractive index of 1.58. This means that the refractive indices for the first, second and third optical regions satisfy the relationship of $n_1<n_2<n_3$. Therefore, the original specification and drawings provide support for and a written description of the claimed feature. Withdrawal of the new matter objection and written description rejection is warranted.

Regarding the rejection of claim 52 as being anticipated by Knop, Knop fails to disclose the claimed features whereby: (1) the top of a first relief pattern is aligned with the bottom of a second relief pattern and (2) the bottom of the first relief pattern is aligned with the top of the second relief pattern. The Final Rejection proposes that Knop discloses all of the claimed features in Fig. 6. and column 6 of the specification.

However, Knop discloses in Fig. 6 a diffractive grating structure comprising a transparent material 108 (first optical region), a layer 102 (second optical region), and a substrate 100 (third optical region) that are stacked to form a boundary 106 between transparent material 108 and layer 102 (first grating) and a boundary 104 between layer 102 and substrate 100 (second grating) (Knop col. 5, lines 40-47). As may be determined by inspection of Fig. 6, the top (i.e., crest) of the relief pattern formed by boundary 106 is aligned with the top of the relief pattern formed by boundary 104. Similarly, the bottom (i.e., trough) of the relief pattern formed by boundary 106 is aligned with the bottom of the relief pattern formed by boundary 104. Knop's Fig. 6 illustrates no other relief patterns. Therefore, Knop discloses features contrary to the instant claimed features. Claim 52 recites that the top of the first relief pattern is aligned with the bottom of the second relief pattern and that the

bottom of the first relief pattern is aligned with the top of the second relief pattern.

Accordingly, Knop fails to anticipate the structure defined by claim 52. Therefore, allowance of claim 52 is warranted.

Moreover, Knop's Fig. 6 and its accompanying description do not disclose a structure whose first, second, and third optical materials have refractive indices n_1, n_2, and n_3 satisfying the relationship $n_1<n_2<n_3$. Knop's Fig. 6 is described in the specification in col. 5, lines 40-51. Nowhere in the description of Fig. 6 does Knop identify values for the refractive indices n_1, n_2, and n_3 or the relationship $n_1<n_2<n_3$ among the three refractive indices.

The Final Rejection proposes that Knop discloses in column 6 values for the refractive indices illustrated in Fig. 6 that satisfy the relationship $n_1<n_2<n_3$ (Final Rejection page 3, last three sentences). However, column 6 of Knop's specification only describes Fig. 8, which Knop describes as a functional equivalent of the structure illustrated in Fig. 7 (Knop col. 6, lines 3-6). Knop additionally discloses that the structural embodiment of Fig. 7 is substantially different than that of Fig. 6 (col. 5, lines 53-55).

Under 35 USC §102, every limitation of a claim must identically appear in a single prior art reference for it to

anticipate the claim. *Gechter v. Davidson, 116 F.3d 1454, 1457, 43 USPQ2d 1030, 1032 (Fed. Cir. 1997)*. A finding of anticipation requires that the reference describe all of the elements of the claim, arranged as in the claimed device. *C.R. Bard, Inc. v. M3 Systems, Inc., 157 F.3d 1340, 1349, 48 USPQ2d 1225, 1230 (Fed. Cir. 1998)*. It is hornbook law that anticipation must be found in a single device or process. *Studiengesellschaft Kohle, M.B.H. v. Dart Indus., Inc., 726 F.2d 724, 726-27, 220 USPQ 841, 842 (Fed. Cir. 1984)*. Simply put, a finding of anticipation requires that the reference disclose all of the claimed features in a single device and in the arrangement defined by the claim.

Knop's Fig. 6 and its accompanying description do not disclose a structure whose refractive indices satisfy the relationship $n_1<n_2<n_3$. Therefore, allowance of claim 52 is warranted for this independent reason.

Furthermore, even assuming, *arguendo*, that refractive index n_2 had a value of 1.38 and refractive index n_3 had a value of 1.6, as proposed in the Final Rejection (page 3, last paragraph), Knop discloses that the transparent material 108 is a protection layer provided between layer 102 and ambient 110 (Knop col. 5, lines 44-46). As a result, transparent material 108 should have a refractive index higher than 1.0. Since Knop does not disclose how much higher than 1.0 the refractive index n_1 should be, it

would be impossible to determine from Knop's disclosure whether the refractive indices for the structure of Fig. 6 satisfy the relationship $n_1<n_2<n_3$.

Regarding the rejections of claims 36, 40 and 42, Sakata fails to disclose, *inter alia*, the claimed features recited in these claims whereby: (1) the top of a first relief pattern is aligned with the bottom of a second relief pattern and (2) the bottom of the first relief pattern is aligned with the top of the second relief pattern, when viewed in a direction of the optical axis.

The Final Rejection proposes that Sakata discloses in Figs. 2A-2D liquid crystal light modulation devices that include a first relief pattern formed between first and second optical regions and a second relief pattern formed between second and third optical regions (Final Rejection page 4, last paragraph). However, in these liquid crystal light modulation devices, the tops and bottoms of the first relief pattern are not aligned with the tops and bottoms of the second relief pattern, respectively, but are aligned with the bottoms and tops of the second relief pattern, respectively. That is to say, the structure of the first and second relief patterns of Sakata is entirely different from that defined by claims 36, 40 and 42 of the present application.

The Final Rejection acknowledges that Sakata does not disclose these features (Final Rejection page 5, first paragraph). To overcome this deficiency, the Final Rejection proposes that the orientation of gratings are known factors in the art for designing gratings to have desired diffraction properties, since the groove positions determine the optical path length difference, which is an essential factor for designing the diffraction property of the gratings (page 5, first paragraph). Continuing, the Final Rejection proposes that it would have been obvious to one skilled in the art to modify the groove positions so that they align with each other for the purpose of creating a diffractive optical element having a desired diffraction property (page 5, first paragraph).

However, as described in the specification of the present application from page 28, line 20, to page 29, line 5, when the tops and bottoms of the first relief pattern are aligned with the tops and bottoms of the second relief pattern, the ratio α becomes positive. When the tops and bottoms of the first relief pattern are aligned with the bottoms and tops of the second relief pattern, the ratio α becomes negative. Therefore, in Sakata, the ratio α is negative and in claims 36, 40 and 42 of the present application the ratio α is positive.

As described in the specification, page 23, lines 18-26, only the wavelength dependency of the diffraction efficiency at the specific wavelength can be independently adjusted or controlled by suitably setting the ratio α, while a diffractive efficiency at the specific wavelength can be maintained optimally. Applicant is the first person to recognize this feature. Therefore, for the diffractive optical element defined by claims 36, 40 and 42 of the present application, it is essential that the ratio α be positive. As explained above, Sakata teaches an optical element having a negative ratio α, and, therefore, the subject matter of claims 36, 40 and 42 of the present application could not be derived from Sakata.

Although it may be known that the positions and patterns of gratings determine the diffraction property, one skilled in the art could not predict the relationship between the sign of the ratio α and the control of the wavelength dependency of the diffraction efficiency, based on Sakata's disclosure.

Accordingly, the prior art teachings fail to provide a motivation to modify Sakata's structure to make the claimed combination. Therefore, allowance of claims 36, 40, and 42 is warranted.

Moreover, the Final Rejection proposes that Sakata teaches that the transparent substrates of Figs. 2A-2D may be made from

glass having a refractive index of 1.78 and a liquid crystal material having a refractive index of about 1.5 (Final Rejection page 4, last paragraph). Based on this, the Final Rejection proposes that Sakata teaches the relationships $n_3>n_2$ and $n_1>n_2$.

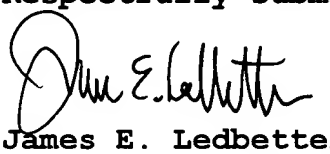
However, Sakata does not disclose that the substrates of Figs. 2A-2D may be made in this way. The only references Sakata makes to the value of 1.78 is with respect to Figs. 5A-5G (see Sakata col. 8, lines 22-46). Sakata discloses that Figs. 5A-5G illustrate formation of the device shown in Fig. 3A (col. 2, lines 61-62). Additionally, Sakata discloses that Figs. 2A-2D and Fig. 3A show different embodiments of the liquid crystal light modulation device (col. 2, lines 53-57). The Final Rejection fails to provide a motivation for combining the features used to form the device of Fig. 3A with those used to form the distinct device illustrated in Figs. 2A-2D.

Accordingly, the Final Rejection does not provide a motivation for combining the features of distinct embodiments of Sakata's invention. Therefore, allowance of claims 36, 40, and 42 is warranted for this independent reason.

In view of the above, it is submitted that this application is in condition for allowance and a notice to that effect is respectfully solicited.

If any issues remain which may best be resolved through a telephone communication, the Examiner is requested to telephone the undersigned at the local Washington, D.C. telephone number listed below.

Respectfully submitted,



Date: March 3, 2004
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